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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,802	01/15/2004	Dae-Woong Kang	8750-042	6500

20575 7590 01/25/2007  
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PORTLAND, OR 97204

EXAMINER
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WARREN, MATTHEW E

ART UNIT	PAPER NUMBER
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2815

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/25/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/758,802	KANG ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Matthew E. Warren	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 08 November 2006.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 22-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-36 is/are allowed.
- 6) ☒ Claim(s) 22-28, 37 and 38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

This Office Action is in response to the Amendment filed on November 8, 2006.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 22-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22 recites the amended limitation of "... a bottom corner of the step region is spaced apart laterally from a vertical axis passing through an upper edge corner of the second active region toward the second isolation layer adjacent to the vertical axis ... ." It is not understood structurally how a bottom corner of the step region is spaced apart laterally and "toward the second isolation layer." For purposes of examination, this limitation will be ignored until the applicant provides clarification.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

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only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22, 23, 28, 37, and 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Furuta et al. (US 6,921,947 B2).

In re claim 22, Furuta et al. shows (fig. 14) a semiconductor device, comprising: a semiconductor substrate having a low voltage region (thin film portion BR) and a high voltage region (thick film portion AR); a first isolation layer (2 on the right) formed in the low voltage region and defining a first active region (5B); a second isolation layer (2 on the left) formed in the high voltage region and defining a second active region (5A); a low voltage gate insulation (GX2) layer formed on the first active region; and a high voltage gate insulation layer (GX1) formed on the second active region and having a greater thickness than the low voltage gate insulation layer. A top surface of the second isolation layer is higher than that of the high voltage gate insulation layer to form a step region from the top surface of the high voltage gate insulation layer to the top surface of the second isolation layer wherein a bottom corner of the step region (the center cut portions of the isolation layer that face away from the active region 5A) is spaced apart laterally from a vertical axis passing through an upper edge corner of the second active region (The step portion is the formed in the left side and center isolation regions 2. Each step portion is formed in the center of the isolations regions and faces away from the high voltage gate insulation layer GX1). The bottom corner of the step region is above the upper edge corner of the second active region.

In re claim 23, Furuta shows (fig. 14) a low voltage gate electrode (GT2) formed on the low voltage gate insulation layer and disposed to cross over the first active

region; and a high voltage gate electrode (GT1) formed on the high voltage gate insulation layer and disposed to cross over the second active region.

In re claim 28, Furuta shows (fig. 14) that an edge region of the first isolation layer (2 on the right) is lower than a top surface of the low voltage gate insulation layer (GX2) because the isolation region has a recess portion that is formed below the top surface of the first active layer (5B).

In re claim 37, Furuta shows (fig. 14) that substantially the entire step region is spaced apart from the vertical axis passing through the edge corner of the second active region since the step region is formed in the center of the isolation layer and spaced away from the edge of the active region.

In re claim 38, Furuta et al. shows (fig. 14) a semiconductor device, comprising: a semiconductor substrate having a low voltage region (thin film portion BR) and a high voltage region (thick film portion AR); a first isolation layer (2 on the right) formed in the low voltage region and defining a first active region (5B); a second isolation layer (2 on the left) formed in the high voltage region and defining a second active region (5A); a low voltage gate insulation (GX2) layer formed on the first active region; and a high voltage gate insulation layer (GX1) formed on the second active region and having a greater thickness than the low voltage gate insulation layer. A top surface of the second isolation layer is higher than that of the high voltage gate insulation layer to form step regions from the top surface of the high voltage gate insulation layer to the top surface of the second isolation layer wherein a distance between the bottom portion of the first step region (in isolation layer 2 on the left) and the bottom portion of the an

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adjacent step region (in isolation layer 2 in the center of the device) that is across the second active region from the first step region is greater than the width of the top surface of the second active region. The bottom portion of the first step region is above the top surface of the second active region.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 24 –27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furuta et al. (US 6,921,947 B2) as applied to claim 22 above, and further in view of Kim (US 6,642,105 B2).

In re claims 24 and 25, Furuta discloses (col. 1, lines 29-35) that devices having different driving voltages may comprise memory portions but does not specifically disclose that the low voltage region is a memory cell region or that the low voltage gate insulation layer is a tunnel oxide layer. Kim discloses (col. 2, lines 44-50) a device in which that the low voltage region is a memory cell region. Kim shows in (fig. 31b) that the low voltage gate insulation layer is a tunnel oxide layer. Forming the memory cell in this manner forms non-volatile memory devices having low power consumption. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Furuta by forming a memory cell array

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region in the low voltage region as taught by Kim to form a non-volatile memory device having low power consumption.

In re claim 26, Kim shows (fig. 32) that a control gate electrode (CG) is formed over the low voltage gate insulation layer (305b), the control gate electrode crossing over the first active region; a floating gate (FG) is interposed between the control gate electrode and the low voltage gate insulation layer; a main gate electrode formed on the high voltage gate insulation layer, the main gate electrode (313a) crossing over the second active region; a dummy gate electrode (317a) stacked on the main gate electrode; and an inter-gate dielectric layer (315a) interposed between the floating gate and the control gate.

In re claim 27, Kim shows (fig. 32) that a thermal oxide (311) layer is interposed between the first isolation layer (309 right) and the semiconductor substrate, and between the second isolation layer (309 left) and the semiconductor substrate.

### ***Response to Arguments***

Applicant's arguments filed with respect to claims 22-28, 37, and 38 have been fully considered but they are not persuasive. The applicant primarily asserts that the prior art does not show all of the elements of the claims, specifically that Furuta does not show the amended limitations of the bottom corner of the step region being above the upper edge corner of the second active region. The examiner believes that the cited references show all of the elements of the claims. As stated in the rejection above, Furuta shows in an alternate embodiment (of figure 14) that the step region of the

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isolation layers (2) facing the second active region (5A) have bottom corner portions that are above the edge portions of the active region. Furthermore, another bottom corner (center cut or top most step facing away from the second active region) of the step region is also formed above the edge portions of the active region. As seen in figure 14 of Furuta, the step portion is formed from the top surface of the gate oxide film (GX1) to the top surface of the isolation layer (2) since the isolation film is formed continuously from the top surface of the gate oxide film. Therefore, Furuta shows the limitations in question and ultimately shows all of the limitations of the claims. The rejection is proper and this action is made final.

***Allowable Subject Matter***

Claims 29-36 are allowed.

The following is an examiner's statement of reasons for allowance: the prior art references, alone or in combination, do not show a first active region having a protruded edge portion that extends above the top surface. The closest prior art reference, Chen et al. (US Pub. 2005/0199914 A1) shows (fig. 2H) a protruded edge portion (40), but does not show that the protruded edge portion extends above the top surface of the active region. Chen cannot be combined with Kim because Chen discloses a memory cell device having a floating gate formed in a trench in which the protruding edge injects electrons into the floating gate, whereas Kim only shows a trench isolation structure for separating active regions. The two devices are different and thus one of ordinary skill in the art could not look to Chen to find motivation for modifying or improving Kim.



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Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew E. Warren whose telephone number is (571) 272-1737. The examiner can normally be reached on Mon-Thur and alternating Fri 9:00-5:00pm.

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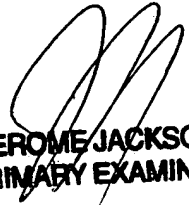
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MEW

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January 21, 2007

  
**JEROME JACKSON**  
**PRIMARY EXAMINER**